

TUNNEL COMMUNICATIONS TEST RESULTS

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ABSTRACT

Safety and cost issues associated with the lack of reliable beyond-earshot-communication (both within and from within to outside of Reclamation tunnels) often increase tunnel cleaning/ maintenance intervals. In addition, some tunnels fall into the OSHA confined-space definitions. Such spaces generally require reliable communication capability if people are to work in them.

If significantly improved communication can be implemented, enhanced safety and lower tunnel maintenance costs can result. To see if improved voice communication is feasible with current technology, during early 1997, voice radio communication tests were performed at Soap Lake Siphon near Ephrata, Washington, and Azotea tunnel near Chama, New Mexico. The Soap Lake Siphon tests compared the within-tunnel distance performance of 160-MHz-class hand-held radios and 900-MHz-class hand-held radios, as well as providing 600-MHz to 16-GHz radio-frequency received signal-strength vs. distance (propagation) data. At Azotea tunnel the performance of a commercial 400-MHz wireless system, and a low frequency lossy-feeder system operating at 280-520 KHz were also tested. The test data and results are presented in these notes. The 900-MHz-class hand-held radios significantly outperformed the other off-the-shelf communication systems tested and was by far the easiest system to use. The usable communication distance improves as the frequency increases up to 6 GHz. From 6 to 16 GHz the usable communications distance changes little.

In general, the use of higher-frequency radios within Reclamation water conveyance tunnels looks to be a viable communication alternative. Testing showed that at higher frequencies, not yet incorporated into commercial hand-held or easily portable radio systems, reliable, repeaterless communication throughout the entire length of the longest Reclamation tunnels might be feasible.